



# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA19 | Coleshill Junction

**Water resources assessment (WR-002-019)**

Water resources

November 2013

ES 3.5.2.19.13

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# Appendix WR-002-019

Environmental topic:	Water resources and flood risk assessment	WR
Appendix name:	Water resources assessment	002
Community forum area:	Coleshill Junction	019

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# 1 Introduction

## 1.1 Structure of the water resources and flood risk assessment appendices

- 1.1.1 The water resources and flood risk assessment appendices comprise three parts. The first of these is a route-wide appendix (Appendix WR-001-000).
- 1.1.2 Three specific appendices for each community forum area (CFA) are also provided. For Coleshill Junction (CFA19) these are:
  - a Water Resource Assessment (i.e. this appendix);
  - a Flood Risk Assessment (Appendix WR-003-019); and
  - a River Modelling Report (Appendix WR-004-012).
- 1.1.3 Maps referred to throughout the water resources and flood risk assessment appendices are contained in the Volume 5: Map Book – Water resources, Maps WR-01 to WR-06 and the Volume 5: Map Book – ecology, Maps EC-01 to EC-04.

## 1.2 Study area

- 1.2.1 The study area is located between Chelmsley Wood, Water Orton, and Coleshill Parkway, and is predominantly within the Borough of North Warwickshire. An area of the study area which lies west of the M6 is within Solihull Metropolitan District.
- 1.2.2 The Coleshill Junction area is semi-rural and overlies several superficial deposits as well as Mercia Mudstone Group bedrock. Topography is relatively flat and ranges from approximately 70m to 95m above Ordnance Datum (AOD).
- 1.2.3 The spatial scope of the surface water assessment was based upon the identification of surface water and groundwater features within 1km of the centreline of the Proposed Scheme, except where there is clearly no hydraulic connectivity as outside of these distances it is unlikely that direct impacts upon the water environment will be attributable to the Proposed Scheme. Where works extend more than 200m from the centreline, for example at diversions and new/realigned roads, a professional judgement was made in selecting the appropriate limit to the extension in spatial scope required. For the purposes of this assessment this is defined as the study area.
- 1.2.4 Due to the number of ponds and other water features present within the study area, only those either within the land required for the construction or operation of the scheme, or within the calculated zone of influence (i.e. those potentially affected by the Proposed Scheme) have been detailed in the baseline.

## 2 Stakeholder engagement

2.1.1 Discussions with the following stakeholders has been undertaken to inform the water resources assessment:

- the Environment Agency on 31 September 2012 to discuss multiple aspects of the Proposed Scheme;
- the Environment Agency on 21 December 2012; and
- the Environment Agency and Warwickshire Lead Local Flood Authority (LLFA) on 4 June 2013.

## 3 Baseline data

### 3.1 General

3.1.1 The following section provides a current description of water resources including surface water and groundwater.

### 3.2 Surface water features

3.2.1 All surface water features within 1km of the route are presented in Table 1.

3.2.2 The current surface water baseline is shown in the Volume 5: Map Book – water resources, Map WR-01-032. Where a water feature in Table 1 has been given a map reference it appears on this map.

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Table 1: Surface water features within 1km of the route in CFA19

Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Tributary of River Blythe	At A452 Chester Road, 630m east of the route Map WR-01-032 (l4)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572) Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Drain (1) to River Blythe	At Bogs Farm, 730m east of the route Map WR-01-032 (l3)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572) Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Drain (2) to River Blythe	At Bogs Farm, 775m east of the route Map WR-01-032 (l3)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572) Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Drain (1) to River Blythe	At Pool Wood, 260m east of the route Map WR-01-032 (l4)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572) Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.

<sup>1</sup> Only ponds within the land required for the permanent proposed scheme are listed in this table.

<sup>2</sup> Map references taken from Volume 5: Map Book – water resources, Map WR-01-032.

<sup>3</sup> Environment Agency water-feature classification: The Land Drainage Act 1991 defines an Ordinary watercourse as 'A watercourse that is not part of a main river, all rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows'. 'Main Rivers' are larger rivers and streams designated by DEFRA, main rivers are regulated by the Environment Agency.

<sup>4</sup> Year may vary in different RBMPs.

<sup>5</sup> Environment Agency (2009), *River Basin Management Plan: Humber River Basin District*.

<sup>6</sup> For examples of receptor value see Table 43 in the SMR addendum Volume 5 Appendix CT-001-000/2.

<sup>7</sup> Q95 flow values only provided for water features that will be crossed by the route.

Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Drain to River Blythe	Drainage network around A446 Lichfield Road, 650m east of the route  Map WR-01-032 (l4)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572)  Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Drain (2) to River Blythe	At Pool Wood, 580m east of the route  Map WR-01-032 (l4)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572)  Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Drain (3) to River Blythe	At Bogs Farm, 790m east of the route  Map WR-01-032 (l3)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572)  Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Tributary of River Blythe	At Pool Wood, 335m east of the route  Map WR-01-032 (l4)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572)  Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.
Tributary of River Blythe	At The Bogs, 690m east of the route  Map WR-01-032 (H4)	Ordinary watercourse	River Blythe from Patrick Bridge to River Tame (GB104028042572)  Moderate Status	Good Status	Moderate	-	River Blythe	-	Will not be crossed by the route.

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Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Drain to River Cole	At junction 7a on the M42, will be crossed by the route (SWC-CFA19-001) Map WR-01-032 (H5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	
Tributary to River Cole	At Green Lane, will be crossed by the route (SWC-CFA19-002) Map WR-01-032 (G5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	0.001m <sup>3</sup> /s	River Cole	0.945km <sup>2</sup>	
Lake/ reservoir	At Green Lane, 390m east of the route Map WR-01-032 (G5)	Not applicable			Moderate	-	-	-	Will not be crossed by the route.
Tributary to River Cole	East of M42, 190m west of the route Map WR-01-032 (G6)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
Tributary to River Cole	East of Green Lane, 390m east of the route Map WR-01-032 (G5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.

Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
2nd crossing of Tributary to River Cole	At Green Lane, will be crossed by the route (SWC-CFA19-003)  Map WR-01-032 (G5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	0.001m <sup>3</sup> /s	River Cole	0.945km <sup>2</sup>	
Coleshill Brook – Tributary to River Cole	At Coleshill Hall Bridge, will be crossed by the route (SWC-CFA19-004)  Map WR-01-032 (G5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	0.001m <sup>3</sup> /s	River Cole	0.875km <sup>2</sup>	Designated as a FRM River.
Tributary of River Cole	At Woodlands Cemetery, 390m west of the route  Map WR-01-032 (F6)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
River Cole	At Manor Drive, Birmingham spur (from the delta junction interchange to Curzon Street Station), will be crossed by the route (SWC-CFA19-005)  Map WR-01-032 (F6)	Main river	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	High	0.188m <sup>3</sup> /s	River Cole	130km <sup>2</sup>	

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Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
River Cole	At M42/M6 Toll, will be crossed by the route (SWC-CFA19-006) Map WR-01-032 (F5)	Main river	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	High	0.188m <sup>3</sup> /s	River Cole	130km <sup>2</sup>	
Tributary of River Cole	At Coleshill Manor, 300m west of the route Map WR-01-032 (F6)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
Tributary of River Cole	At South Drive, Coleshill Hall, 100m east of the route Map WR-01-032 (F5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
Tributary of River Cole	At Cole End, Coleshill, 690m east of the route Map WR-01-032 (E4)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
Tributary of River Cole	North of the B4414, 360m east of the route Map WR-01-032 (E5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.

Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Tributary of River Cole	At Gilson Road, will be crossed by the route (SWC-CFA19-007) Map WR-01-032 (E5)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	0	River Cole	0.227km <sup>2</sup>	No FEH catchment – calculated from topographic data.
Pond	At Gilson Road (SWC-CFA19-008) Map WR-01-032 (E5)	Not applicable			Refer to ecology Volume 2, CFA Report 19, Section 7 for receptor value for ponds.	-	-	-	Under construction footprint.
Drain feeder to River Cole	The Belt, Green Lane, Birmingham spur (from the delta junction interchange to Curzon Street Station), will be crossed by the route (SWC-CFA19-010) Map WR-01-032 (E6)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	0m <sup>3</sup> /s	River Cole	0.227km <sup>2</sup>	
Pond	At Green Lane Track, The Belt (SWC-CFA19-009) Map WR-01-032 (E6)	Not applicable			Refer to ecology Volume 2, CFA Report 19, Section 7 for receptor value for ponds.	-	-	-	Under construction footprint.

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Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Drain feeder to River Tame	At Watton House – Jack O'Watton, Water Orton, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-014)  Map WR-01-032 (D6)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	om <sup>3</sup> /s	River Tame	0.262km <sup>2</sup>	No FEH catchment – calculated from topographic data.
Tributary of River Tame	Extended culvert under M42/B4117 Gilson Road, Water Orton, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-015)  Map WR-01-032 (D6)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	om <sup>3</sup> /s	River Tame	0.262km <sup>2</sup>	No FEH catchment – calculated from topographic data.
Tributary of River Tame	South of Gypsy Lane, Water Orton, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-016)  Map WR-01-032 (D6)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	om <sup>3</sup> /s	River Tame	0.262km <sup>2</sup>	No FEH catchment – calculated from topographic data.

Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Pond (1)	South of Gypsy Lane, Gilson, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-017)  Map WR-01-032 (D6)	Not applicable			Refer to ecology Volume 2, CFA Report 19, Section 7 for receptor value for ponds.	-	-	-	
Pond (2)	South of Gypsy Lane, Gilson, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-018)  Map WR-01-032 (D6)	Not applicable			Refer to ecology Volume 2, CFA Report 19, Section 7 for receptor value for ponds.	-	-	-	
Tributary of River Tame	South of Vicarage Lane, Water Orton, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-019)  Map WR-01-032 (D6)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	om <sup>3</sup> /s	River Tame	0.262km <sup>2</sup>	No FEH catchment – calculated from topographic data.

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Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Pond	South of Vicarage Lane, Gilson, north chord (from Curzon Street Station to Manchester), will be crossed by the route (SWC-CFA19-020)  Map WR-01-032 (D6)	Not applicable			Refer to ecology Volume 2, CFA Report 19, Section 7 for receptor value for ponds.	-	-	-	
Drain feeder to River Cole.	On the Catmore-Coleshill Manor, 570m west of the route  Map WR-01-032 (E7)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
Drain feeder to River Cole.	At Station Road, Coleshill, 825m east of the route  Map WR-01-032 (D4)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420)  Moderate Potential	Good Potential	Moderate	-	River Cole	-	Will not be crossed by the route.
Tributary of River Tame.	Extended culvert under A446 Lichfield Road, Jack O'Watton Industrial Estate, Water Orton, will be crossed by the route (SWC-CFA19-011)  Map WR-01-032 (D5)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	om <sup>3</sup> /s	River Tame	Not defined within low flows.	

Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Tributary to River Tame.	At Jack O'Watton Industrial Estate, Water Orton, will be crossed by the route  (SWC-CFA19-012)  Map WR-01-032 (D5)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	om <sup>3</sup> /s	River Tame	Not defined within low flows.	
River Tame.	At Coleshill Industrial Estate, Edison Road, will be crossed by the route  (SWC-CFA19-013)  Map WR-01-032 (C5)	Main river	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Very high	-	River Tame	-	
Tributary of River Tame.	At Water Orton, 490m west of the route  Map WR-01-032 (C8)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	High	-	River Tame	-	Will not be crossed by the route.
Drain feeder to River Tame	Downstream of Curdworth Bridge, 270m west of the route  Map WR-01-032 (C6)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	-	River Tame	-	Will not be crossed by the route.

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Water Feature <sup>1</sup>	Location Description (map reference) <sup>2</sup>	Watercourse classification <sup>3</sup>	Water Framework Directive (WFD) water body name and identifier and overall status	WFD status Objective (by 2027 <sup>4</sup> as per River Basin Management Plan (RBMP) <sup>5</sup> unless stated	Receptor Value <sup>6</sup>	Q95 <sup>7</sup>	Catchment	Size	Notes
Drain feeder to River Tame	East of A446 Lichfield Road, 130m west of the route  Map WR-01-032 (C6)	Ordinary watercourse	River Tame from Confluence of the two arms to River Blythe (GB104028046840)  Moderate Potential	Good Potential	Moderate	-	River Tame	-	Will not be crossed by the route.

\* Where a number of small watercourses are located in close proximity, the combined catchment size has been provided.

3.2.3 Table 2 summarises licensed surface water abstractions within 1km of the route. Surface water abstracted for public supply is not known for reasons of national security. Information from North Warwickshire Borough Council indicates that there are no unlicensed abstractions from surface water used for potable supply in their records.

Table 2: Licensed surface water abstractions

Licence identifier (map reference number and Environment Agency reference)	Distance from route	Abstraction source	Max annual abstraction quantity	Max daily abstraction quantity	Purpose
No abstractions within 1km of the route in this study area.					

3.2.4 Table 3 summarises surface water discharge environmental permits within 1km of the route.

Table 3: Environmental permits for surface water discharge

Reference number	Permit identifier	Distance from route	Discharge type	Receiving water feature
1462900 Map WR-01-032 (E4)	T417/1	785m east of the route	Surface water discharge	River Cole
1462901 Map WR-01-032 (E4)	T/12/02492/O	785m east of the route	Sewage discharge	River Cole
27246227 Map WR-01-032 (E4)	T/12/36069/O	745m east of the route	Sewage discharge	River Cole
1471561 Map WR-01-032 (E4)	T/12/01319/T	980m east of the route	Trade discharge	River Cole
1465861 Map WR-01-032 (D3)	T/12/07497/T/1	855m east of the route	Surface water discharge	Grimstock Hill Brook
1473180 Map WR-01-032 (D3)	T/12/02481/O	955m east of the route	Sewage discharge	River Cole
1465866 Map WR-01-032 (D3)	T3037/1	895m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
1473195 Map WR-01-032 (D3)	T/11/20423/T	975m east of the route	Contaminated water discharge	River Cole & River Blythe
1465844 Map WR-01-032 (D3)	T/12/22828/T	815m east of the route	Trade discharge	Tributary of the River Cole
1465835 Map WR-01-032 (D5)	T801/4	540m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
1465838 Map WR-01-032 (D5)	T/10/10413/T	555m east of the route	Trade discharge	Jack O'Watton Brook

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Reference number	Permit identifier	Distance from route	Discharge type	Receiving water feature
1465805 Map WR-01-032 (D5)	T801/3	335m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
1465841 Map WR-01-032 (D5)	T/10/30042/T/1	575m east of the route	Surface water discharge	Jack O'Watton Brook
1465773 Map WR-01-032 (D5)	T801/1	40m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
1465770 Map WR-01-032 (D5)	T/10/01433/T/1	45m east of the route	Trade discharge	River Tame
1465782 Map WR-01-032 (D5)	T801/6	235m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
1465779 Map WR-01-032 (D5)	T801/2	235m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
1465776 Map WR-01-032 (D5)	T801/5	140m east of the route	Surface water discharge	Receiving water body not identified in Envirocheck data
19334204 Map WR-01-032 (D4)	T/12/20304/R	735m east of the route	Sewage discharge	River Tame
19334209 Map WR-01-032 (D4)	T/12/20304/R	735m east of the route	Sewage discharge	River Tame
26659881 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
19334203 Map WR-01-032 (C4)	T/12/20304/R	510m east of the route	Sewage discharge	River Tame
19334202 Map WR-01-032 (C5)	T/12/20304/R	380m east of the route	Sewage discharge	River Tame
104262001 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
104262002 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
104262004 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
27246213 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
96122322 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame

Reference number	Permit identifier	Distance from route	Discharge type	Receiving water feature
19334208 Map WR-01-032 (D4)	T/12/20304/R	655m east of the route	Sewage discharge	River Tame
96122320 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
8901946 Map WR-01-032 (D4)	T/12/35338/R	655m east of the route	Sewage discharge	River Tame
82636787 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
31292755 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
64454804 Map WR-01-032 (D4)	T/12/36068/R	655m east of the route	Sewage discharge	River Tame
1465843 Map WR-01-032 (D4)	T/12/20304/R	655m east of the route	Sewage discharge	River Tame
19449510 Map WR-01-032 (D4)	T/12/35338/R	655m east of the route	Sewage discharge	River Tame
19334207 Map WR-01-032 (C4)	T/12/20304/R	510m east of the route	Sewage discharge	River Tame
19334206 Map WR-01-032 (C5)	T/12/20304/R	380m east of the route	Sewage discharge	River Tame
104262003 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
1465785 Map WR-01-032 (C5)	T/12/20304/R	300m east of the route	Sewage discharge	River Tame
19449509 Map WR-01-032 (C5)	T/12/35338/R	300m east of the route	Sewage discharge	River Tame
31292754 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
19334205 Map WR-01-032 (C5)	T/12/20304/R	2300m east of the route	Sewage discharge	River Tame
96122321 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
64454806 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame

Reference number	Permit identifier	Distance from route	Discharge type	Receiving water feature
96122319 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
8901945 Map WR-01-032 (C5)	T/12/35338/R	300m east of the route	Sewage discharge	River Tame
31292756 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Trade discharge	River Tame
19449511 Map WR-01-032 (C5)	T/12/35338/R	300m east of the route	Trade discharge	River Tame
26659880 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
26659882 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Trade discharge	River Tame
82636786 Map WR-01-032 (C5)	T/12/36068/R	300m east of the route	Sewage discharge	River Tame
1465882 Map WR-01-032 (C9)	CT/10/35096/S 1	640m west of the route	Sewage discharge	Orton Lodge Brook
1465747 Map WR-01-032 (C9)	T/10/20026/S/1	645m west of the route	Sewage discharge	Orton Lodge Brook
1465759 Map WR-01-032 (D8)	T/10/22019/O	655m west of the route	Sewage discharge	Tributary of the River Tame
96122509 Map WR-01-032 (D8)	Tsc3298	690m west of the route	Sewage discharge	Tributary of the River Tame
1465756 Map WR-01-032 (C9)	T/10/22987/T	785m west of the route	Contaminated water discharge	Tributary of the River Tame

### 3.3 Groundwater

- 3.3.1 Groundwater within CFA19 lies entirely within the Tame Anker Mease – Secondary Combined (GB40402G990800) groundwater body.
- 3.3.2 There are two superficial aquifers are located within this area. These are within the Alluvium and River Terrace Deposits 1 and 2 and are designated as Secondary A aquifers.
- 3.3.3 The underlying bedrock aquifer comprising Mercia Mudstone Group-mudstone is designated as a Secondary B aquifer. This aquifer is currently of good quantitative quality and is predicted to maintain good status into 2015. The current chemical quality is poor and is predicted to remain at this status into 2015.

3.3.4 Strata not discussed above are considered to be unproductive by the Environment Agency.

3.3.5 There are no licensed groundwater abstractions or discharges within the study area.

3.3.6 No unlicensed potable supplies have been identified within the study area.

## 3.4 Groundwater/surface water interaction

3.4.1 Table 4 summarises springs, sinks and issues (locations where groundwater rises to the surface in a more diffuse way than at a spring) within the study area. Due to the number of ponds and other water features present within the study area, only those either within the land required for the construction or operation of the scheme, or within the calculated zone of influence, and therefore potentially affected by the Proposed Scheme, are included in Table 4.

Table 4: Groundwater/surface water interaction

Location description and map reference <sup>8</sup>	Distance from route	Formation	Elevation	Comments
Issues 300m east of Pool Farm Map WR-02-019 (F5), located 1.3km south-east of M6 Motorway North viaduct	1,200m east of the route	Glaciofluvial superficial deposits underlain by Mercia Mudstone	95m AOD	May receive groundwater from Secondary A aquifer.
Issues 500m east of Pool farm Map WR-02-019 (F5), located 1.4km south-east of M6 Motorway North viaduct	1,300m east of the route	Glaciofluvial superficial deposits underlain by Mercia Mudstone	95m AOD	May receive groundwater from Secondary A aquifer.
Issues 50m west of M42/M6 junction loop road Map WR-02-019 (F7), located 110m north of M6 Motorway North viaduct	88m west of the route	Mercia Mudstone	90m AOD	May receive groundwater from Secondary B aquifer.
Minor tributary of River Cole 800m north-west of the M42/M6 toll junction Map WR-02-019 (F6), will be crossed by Coleshill West viaduct	Will be crossed by the route	Alluvium underlain by Mercia Mudstone	Not applicable	May receive baseflow from Secondary A aquifer.
Issues 20m south of Coleshill Hall Farm Map WR-02-019 (E6), will be crossed by Coleshill West viaduct	Will be crossed by the route	Alluvium and River Terrace superficial deposits underlain by Mercia Mudstone	80m AOD	May receive groundwater from Secondary B aquifer. Possibly an extended culvert.
Coleshill Hall Brook 800m north-west of the M42/M6 toll junction Map WR-02-019 (E6), will be crossed by Coleshill West viaduct	Will be crossed by the route	Alluvium underlain by Mercia Mudstone	Not applicable	May receive baseflow from Secondary A aquifer.

<sup>8</sup> Map references taken from Volume 5: Map Book – water resources, Maps WR-02-019 and Volume 5: Map Book – ecology, Maps EC-04-054b, EC-04-055 and EC-04-066a.

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Location description and map reference <sup>8</sup>	Distance from route	Formation	Elevation	Comments
Pond within curtilage of Coleshill Hall Farm  Map EC-04-054b (B5), located 200m east of Coleshill West viaduct	60m east of the route	River Terrace Superficial Deposits underlain by Mercia Mudstone	80mAOD	Appears to be an ornamental pond as part of a residence. Possibly fed by small watercourse in ditch directly to the east. Unlikely to be groundwater dependent.
Pond 220m south-west of B4114 Birmingham Road  Map EC-04-55 (H5), located 180m north-east of Coleshill West viaduct	80m east of the route	Mercia Mudstone	80mAOD	Associated with ditch running along edge of field. Possibly fed by water from ditch. Likely to be surface water dependent.
River Cole between Chelmsley Wood and Coleshill  Map WR-02-019 (E6), will be crossed by M42 Coleshill West Viaduct	Will be crossed by the route	Alluvium underlain by Mercia Mudstone	Not applicable	May receive baseflow from Secondary A aquifer.
Sinks 160m south of Adria on the B4117 Gilson Road  Map WR-02-019 (E6), located 230m east of M42 Coleshill North viaduct	220m east of the route	Alluvium and River Terrace superficial deposits underlain by Mercia Mudstone	75mAOD	Sinks appear to go into river terrace deposits. Possibly an extended culvert.
Pond 250m south-west of 'Adria' on the B4117  Map EC-04-55 (E5), located 10m east of M42 Coleshill North viaduct	10m east of the route	River Terrace superficial deposits underlain by Mercia Mudstone	77mAOD	Unlikely to be groundwater dependent as located within a track. Potentially surface water and rainfall dependent.
Collects 160m west of Adria on the B4117 Gilson Road  Map WR-02-019 (E6), located 100m north-east of M42 Coleshill North viaduct	50m east of the route	Mercia Mudstone	80mAOD	May receive groundwater from Secondary B aquifer.
Minor tributary of River Tame at Jack O'Watton  Map WR-02-019 (D6), will be crossed by Water Orton viaducts 1 and 3	Will be crossed by the route	River Terrace superficial deposits underlain by Mercia Mudstone	Not applicable	Extended culvert. May receive baseflow from Secondary A aquifer.
Minor tributary of River Tame at Coleshill Sewage Works  Map WR-02-019 (D6), located 60m west of Water Orton viaducts 1 and 3	Will be crossed by the route	Alluvium underlain by Mercia Mudstone	Not applicable	Extended culvert. May receive baseflow from Secondary A aquifer.
Pond 225m north-west of Gilson Hall, Gilson  Map EC-04-55 (C6), located 265m south of Water Orton viaducts 1 and 3	215m west of the route	Glaciofluvial superficial deposits underlain by Mercia Mudstone	90mAOD	May receive baseflow from Secondary A aquifer.

Location description and map reference <sup>8</sup>	Distance from route	Formation	Elevation	Comments
River Tame located along the northern boundary of the CFA  Map: WR-02-019 (D6), will be crossed by River Tame West viaduct	Will be crossed by the route	Alluvium underlain by Mercia Mudstone	Not applicable	May receive baseflow from Secondary A aquifer.
Minor tributary of River Cole (extended culvert) 400m south-west of the M42/M6 junction at Gilson (junction 8)  Map WR-02-019 (D7), located 350m south-east of M42-M6 Motorway Link West viaduct	Will be crossed by the route (Birmingham spur)	Mercia Mudstone	Not applicable	May receive groundwater from Secondary B aquifer.
Spring 300m west of Coleshill Manor  Map WR-02-019 (E7), located 780m west of M42 Coleshill South viaduct	650m south-west of the route (Birmingham spur)	Mercia Mudstone	80m AOD	May receive groundwater from Secondary B aquifer.
Issues 400m west of Coleshill Manor  Map WR-02-019 (E7), located 680m south of M42-M6 Motorway Link West viaduct	710m south-west of the route (Birmingham spur)	Mercia Mudstone	80m AOD	May receive groundwater from Secondary B aquifer.
Pond 450m north of Coleshill Manor  Map EC-04-066a (G7), located 305m south-east of M42-M6 Motorway Link West viaduct  Identifier 030-AA-195001	Will be crossed by the route (Birmingham spur)	Mercia Mudstone	86m AOD	On elevated topography therefore likely to be rainwater fed.
Pond 450m south-west of Attleboro Farm  Map EC-04-066a (E5), located 355m north-west of M42-M6 Motorway Link West viaduct	Will be crossed by the route (Birmingham Spur)	Mercia Mudstone	83m AOD	Pond located at the corner of a field and could potentially be used by the farmer for livestock. Pond could receive groundwater from Secondary B aquifer.
Issues 50m north of business park at Jack O'Watton  Map: WR-02-019 (D6), located 360m south-west of River Tame West viaduct	325m west of the route (North Chord)	River Terrace deposits underlain by Mercia Mudstone	75m AOD	May receive groundwater from Secondary A aquifer.
Minor tributary of River Tame 750m north-east of the M42/M6 junction at Gilson (junction 8)  Map WR-02-019 (D6), will be crossed by Water Orton viaducts 1 and 3	Will be crossed by the route (North Chord)	River Terrace deposits underlain by Mercia Mudstone	Not applicable	May receive baseflow from Secondary A aquifer.

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Location description and map reference <sup>8</sup>	Distance from route	Formation	Elevation	Comments
Minor tributary of River Tame 500m north of the M42/M6 junction at Gilson (junction 8)  Map WR-02-019 (D7), located 235m south-west of Water Orton viaducts 1 and 3	Will be crossed by the route (North Chord)	Mercia Mudstone	Not applicable	May receive baseflow from Secondary B aquifer.
Pond 640m south-east of Water Orton Primary School, Water Orton  Map EC-04-066a (F4) located 455m south-west of Water Orton viaducts 1 and 3  Identifier o30-AA-210001	Will be crossed by the route (North Chord)	Mercia Mudstone	80m AOD	May receive baseflow from Secondary B aquifer.
Pond 495m east of Water Orton Primary School, Water Orton  Map EC-04-066a (F4), located 490m south-west of Water Orton viaducts 1 and 3  Identifier o30-AA-210004	130m north of the route (North Chord)	Mercia Mudstone	80m AOD	May receive baseflow from Secondary B aquifer.
Minor tributary of River Tame 500m north-west of the M42/M6 junction at Gilson (junction 8)  Map WR-02-019 (D7), located 530m south-west of Water Orton viaducts 1 and 3	Will be crossed by the route (North Chord)	Mercia Mudstone	Not applicable	May receive baseflow from Secondary B aquifer.
Pond 360m south-west of Water Orton Primary School, Water Orton  Map EC-04-066a (E5), located 660m south-west of Water Orton viaducts 1 and 3  Identifier o30-AA-210003	91m north of the route (North Chord)	Mercia Mudstone	80m AOD	May receive baseflow from Secondary B aquifer.
Pond 308m SW of Water Orton Primary School, Water Orton  Map EC-04-066a (E5) Located 350m north-west of M42-M6 Motorway Link West viaduct	20m south of the route (North Chord)	Mercia Mudstone	80m AOD	May receive baseflow from Secondary B aquifer.
Pond 150m south-east of Water Orton Primary School  Map EC-04-066a (E5), located 520m north-west of M42-M6 Motorway Link West viaduct	80m north of the route (North Chord)	Mercia Mudstone	83m AOD	May receive groundwater from Secondary B aquifer.

## 3.5 Water dependent habitats

3.5.1 Table 5 summarises the potential water dependent habitats within the study area. These have been identified from a review of Ordnance Survey (OS) mapping, aerial photography and from the following sources:

- information on designated and potential non-statutory Local Wildlife Sites (LWS) from Warwickshire Biological Records Centre;
- information on statutory designated sites from Natural England; and
- information from ecological surveys carried out in support of the Environmental Impact Assessment (EIA).

3.5.2 The table identifies where a water dependency may exist but the assessment of impact on water dependent ecology receptors is found in Volume 2, CFA Report 19, Section 7.

Table 5: Description of water dependent habitats

Location and map reference <sup>9</sup>	Distance	Designation	Comments
River Cole  Map EC-01-054b, B6, located along the River Cole between Chelmsley Wood and Gilson	70m west of the route	Not designated. Identified as wet habitat of concern.	Potentially groundwater and surface water dependent as river lies on permeable superficial and bedrock deposits.
Wheeley Moor Farm Meadows  Map EC-01-054b, B7, located approximately 1.1km north-east of M42/M6 toll junction near Chelmsley Wood (junction 7a)	70m west of the route	LWS	The site is wet and situated upon permeable strata.
Coleshill Hall Farm  Map EC-01-054b, 5B, located approximately 1.1km north-east of M42/M6 toll junction near Chelmsley Wood (junction 7a)	Will be crossed by the route	LWS	Issues located within the receptor therefore receptor may be partially groundwater dependent. Areas of marshy grassland present.
Coleshill Park Belt  Map EC-01-055, E8, located approximately 500m south west of the M42/M6 Junction at Gilson (junction 8)	Will be crossed by the route	LWS	There is a spring located in the south of the site. The site is wet and is situated upon permeable strata.
Coleshill Sewage Works Grassland  Map EC-01-055, A6, located approximately 1.3km north of the M42/M6 junction at Gilson (junction 8)	Will be crossed by the route	LWS	Likely to be partially groundwater dependent. Fed by headwater stream sourced from issues on site.
Marsh Lane Grassland and Marsh  Map EC-01-066a, E1, located approximately 500m west of Water Orton Station	530m west of the route	LWS	Area is marshy and on low lying ground. The site is likely to be groundwater dependent as it is situated on permeable strata.

<sup>9</sup> Map references taken from Volume 5: Map Book – ecology, Maps EC-01-054b, EC-01-055 and EC-01-066a.

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Location and map reference <sup>9</sup>	Distance	Designation	Comments
Water Orton Triangle Map EC-01-066a, F1, located approximately 900m west of Water Orton Station	410m west of the route	LWS	The site is wet and situated upon permeable strata.

## 4 Site-specific assessments

### 4.1 Surface water

4.1.1 Table 6 summarises the potential impacts and effects to surface water.

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Table 6: Summary of potential impacts to surface water

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Drain to River Cole at junction 7a on M42. (SWC-CFA19-001)  Map WR-01-032 (H5)	Moderate	M6 motorway south viaduct  M6 motorway north viaduct  M6 motorway box structure  Coleshill no.1 embankment including surface drainage  Realignment of watercourse to suit embankment profile  Drainage outfall  Balancing pond  Realigned Coleshill Heath Road (lowering)  Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

<sup>10</sup> Map references taken from Volume 5: Map Book – water resources, Map WR-01-032.

<sup>11</sup> For examples of receptor value see Table 43 in the SMR addendum Volume 5 Appendix CT-001-000/2.

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
				silt or the direct contamination by polluting materials.					
				Drainage outfall (from railway)					
				Moderate adverse	Impact on flows in the receiving watercourse. Deterioration of water quality due to contamination of surface water from both routine discharges from the proposed railway and associated infrastructure or from accidental spillages.	Drainage has been designed to reduce the rate and volume of run-off from the proposed railway and to provide temporary storage for potential spillages. Balancing pond before outfall to watercourse to restrict run-off rates and reduce the effect on water quality by reducing potential contaminants through filtration, vegetative absorption or settlement.	Negligible Neutral (not significant)	None required	Negligible Neutral (not significant) Construction (Permanent)
				Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourse.	Negligible Neutral (not significant)	None required

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (associated with the lowering of Coleshill Heath Road, assumed to have mitigation and outfall to drain to River Cole at junction 7a on M42)	Moderate adverse	Impact on flows in the receiving watercourse.  Deterioration of water quality due to contamination of surface water from both routine discharges from the road and associated infrastructure or from accidental spillages.	Drainage has been designed to reduce the rate and volume of run-off from the road and to provide temporary storage for potential spillages.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Permanent)
		Realignment of watercourse to suit embankment profile	Moderate adverse	Deterioration or loss of the existing water environment, flows and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourses, for example by including meanders and enhanced banks.	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	None required	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	Construction (Permanent)
		All elements (maintenance)	Moderate adverse	Deterioration of water quality due to contamination from de-icing substances used during cold weather and herbicides for managing vegetation on the tracks.	Best practice pollution control guidance will be adopted for maintenance of the Proposed Scheme.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Operation

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Tributary to River Cole at Green Lane (SWC-CFA19-002)  Map WR-01-032 (G5)	Moderate	M6 Motorway north viaduct  Coleshill no.1 embankment including surface drainage  Coleshill no.2 embankment including surface drainage  Assumed realignment of watercourse to suit embankment profile	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting materials.	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Realignment of watercourse to suit embankment profile	Moderate adverse	Deterioration or loss of the existing water environment, flows and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourses, for example by including meanders and enhanced banks.	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	None required	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	Construction (Permanent)
2nd crossing of tributary to River Cole at Green Lane  (SWC-CFA19-003)  Map WR-01-032 (G5)	Moderate	Coleshill no.2 embankment including surface drainage  Coleshill west viaduct  Coleshill east viaduct Birmingham spur southbound viaduct  Drainage outfall  Balancing pond  Balancing pond access track  Realignment of watercourse to suit embankment profile  Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		watercourse		existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting materials.					
		Drainage outfall (from railway)	Moderate adverse	Impact on flows in the receiving watercourse. Deterioration of water quality due to contamination of surface water from both routine discharges from the proposed railway and associated infrastructure or from accidental spillages.	Drainage has been designed to reduce the rate and volume of run-off from the proposed railway and to provide temporary storage for potential spillages.  Balancing pond before outfall to watercourse to restrict run-off rates and reduce the effect on water quality by reducing potential contaminants through filtration, vegetative absorption or settlement.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Permanent)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourse.	Negligible Neutral (not significant)	None required	Negligible Neutral (not significant)	Construction (Permanent)
		Realignment of watercourse to suit embankment profile	Moderate adverse	Deterioration or loss of the existing water environment, flows and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourses, for example by including meanders and enhanced banks.	Minor to Minor Beneficial Slight to Slight Beneficial (not significant)	None required	Minor to Minor Beneficial Slight to Slight Beneficial (not significant)	Construction (Permanent)
		All elements (maintenance)	Moderate adverse	Deterioration of water quality due to contamination from de-icing substances used during cold weather and herbicides for managing vegetation on the tracks.	Best practice pollution control guidance will be adopted for maintenance of the Proposed Scheme.	Negligible Neutral (not significant)	None required	Negligible Neutral (not significant)	Operation

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Coleshill Brook – tributary to River Cole at Coleshill Hall Bridge.  (SWC-CFA19-004)  Map WR-01-032 (G5)	Moderate	Coleshill no.3 embankment including surface drainage  Coleshill no.5 embankment including surface drainage  Coleshill east viaduct  Coleshill no. 1 viaduct Birmingham spur southbound viaduct  Birmingham Road underbridge  Realigned Manor Drive and B4114 Birmingham Road  Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

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Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (associated with B4118 Birmingham Road underbridge, assumed to have mitigation and outfall to tributary of River Cole at Coleshill Hall Bridge)	Moderate adverse	Impact on flows in the receiving watercourse.  Deterioration of water quality due to contamination of surface water from both routine discharges from the road and associated infrastructure or from accidental spillages.	Drainage has been designed to reduce the rate and volume of run-off from the road and to provide temporary storage for potential spillages.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Permanent)
		Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourse.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Permanent)
River Cole at Manor Drive, Birmingham spur (from the delta junction interchange to Curzon Street Station).  (SWC-CFA19-005) Map WR-01-032 (F6);  River Cole at	High	Coleshill no.3 embankment including surface drainage  Coleshill no.4 embankment including surface drainage  Coleshill Manor north retaining wall  Coleshill Manor cutting	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
M42/M6 Toll (SWC-CFA19-006) Map WR-01-032 (F5)		Manor Drive embankment  River Cole east viaduct  River Cole west viaduct  M42 Coleshill south viaduct  Realigned Manor Drive  River Cole division  Drainage outfalls  Balancing ponds  Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse		contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting materials.	operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.				

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfalls (from railway)	Moderate adverse	<p>Impact on flows in the receiving watercourse.</p> <p>Deterioration of water quality due to contamination of surface water from both routine discharges from the proposed railway and associated infrastructure or from accidental spillages.</p>	<p>Drainage has been designed to reduce the rate and volume of run-off from the proposed railway and to provide temporary storage for potential spillages.</p> <p>Balancing pond before outfall to watercourse to restrict run-off rates and reduce the effect on water quality by reducing potential contaminants through filtration, vegetative absorption or settlement.</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>Construction (Permanent)</p>
		Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to retain and if possible enhance the overall quality of the watercourse.	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>Construction (Permanent)</p>

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (from diversion of Manor Drive, assumed to have mitigation and outfall to River Cole)	Moderate adverse	Impact on flows in the receiving watercourse.  Deterioration of water quality due to contamination of surface water from both routine discharges from the road and associated infrastructure or from accidental spillages.	Drainage has been designed to reduce the rate and volume of run-off from the road and to provide temporary storage for potential spillages.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Permanent)
		Realignment of River Cole	Moderate adverse	Deterioration or loss of the existing water environment, flows and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourses, for example by including meanders and enhanced banks.	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	None required	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	Construction (Permanent)
		All elements (maintenance)	Moderate adverse	Deterioration of water quality due to contamination from de-icing substances used during cold weather and herbicides for managing vegetation on the tracks.	Best practice pollution control guidance will be adopted for maintenance of the Proposed Scheme.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Operation

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Tributary of River Cole at Gilson Road.  (SWC-CFA19-007) Map WR-01-032 (E5)	High	Gilson embankment including surface drainage  Gilson Road retaining wall  M42 Coleshill box structure  M42 Coleshill north viaduct  B4117 Gilson Road realignment  Culvert under realigned Gilson Road  Balancing pond  Drainage outfall	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting materials.	Adoption of Environment Agency Pollution Prevention Guidelines (PPG) – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (from diversion of Gilson Road, assumed to have mitigation and outfall to tributary of River Cole)	Moderate adverse	<p>Impact on flows in the receiving watercourse.</p> <p>Deterioration of water quality due to contamination of surface water from both routine discharges from the road and associated infrastructure or from accidental spillages.</p>	Drainage has been designed to reduce the rate and volume of run-off from the road and to provide temporary storage for potential spillages.	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	Construction (Permanent)
		Culvert under realigned Gilson Road	Moderate adverse	Culvert may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Improvements along watercourse either side of culvert, to mitigate loss of open length.	<p>Minor to Minor Beneficial</p> <p>Slight to Slight Beneficial (not significant)</p>	<p>None required</p>	<p>Minor to Minor Beneficial</p> <p>Slight to Slight Beneficial (not significant)</p>	Construction (Permanent)

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Surface water feature/receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Pond at Green Lane, The Belt Birmingham spur (from the delta junction interchange to Curzon Street Station).  (SWC-CFA19-009)  Map WR-01-032 (E6)				Refer to ecology Volume 2, CFA Report 19, Section 7 for impact assessment.					
Drain feeder to River Cole, The Belt, Green Lane, Birmingham spur (from the delta junction interchange to Curzon Street Station).  (SWC-CFA19-010)  Map WR-01-032 (E6)	Moderate	Green Lane embankment including surface drainage  Coleshill culvert  Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction	Negligible  Neutral  (not significant)	None required	Negligible  Neutral  (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
				has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting materials.	compounds.				
				Culvert may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Improvements along watercourse either side of culvert, to mitigate loss of open length.	Minor to Minor Beneficial  Slight to Slight Beneficial  (not significant)	None required	Minor to Minor Beneficial  Slight to Slight Beneficial  (not significant)	Construction (Permanent)
				Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourse.	Negligible  Neutral  (not significant)	None required	Negligible  Neutral  (not significant)	Construction (Permanent)
Consented discharges to the River Tame at Gorsey Lane.	Very high	Lichfield Road embankment assumed to be at the same location as consented discharges	Major adverse	Loss of discharge route.	Re-routing of drainage.	Negligible  Neutral  (not significant)	None required	Negligible  Neutral  (not significant)	Construction (Temporary)  Construction (Permanent)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Tributary of River Tame – extended culvert under A446 Lichfield Road, Jack O'Watton Industrial Estate, Water Orton.  (SWC-CFA19-011) Map WR-01-032 (D5)	Moderate	Lichfield Road embankment including surface drainage  Watton House south embankment  Chattle Hill box structure  Water Orton no. 1 viaduct  Water Orton no. 3 viaduct  Water Orton no.5 viaduct  Water Orton no.4 viaduct  Drainage outfall  Balancing pond	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
032 (D6)		Drainage outfall (from railway)	Moderate adverse	<p>Impact on flows in the receiving watercourse.</p> <p>Deterioration of water quality due to contamination of surface water from both routine discharges from the railway and associated infrastructure or from accidental spillages.</p>	<p>Drainage has been designed to reduce the rate and volume of run-off from the railway and to provide temporary storage for potential spillages.</p> <p>Balancing pond before outfall to watercourse to restrict run-off rates and reduce the effect on water quality by reducing potential contaminants through filtration, vegetative absorption or settlement.</p>	<p>Negligible</p> <p>Neutral</p> <p>(not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral</p> <p>(not significant)</p>	<p>Construction</p> <p>(Permanent)</p>
		All elements (maintenance)	Moderate adverse	Deterioration of water quality due to contamination from de-icing substances used during cold weather and herbicides for managing vegetation on the tracks.	Best practice pollution control guidance will be adopted for maintenance of the Proposed Scheme.	<p>Negligible</p> <p>Neutral</p> <p>(not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral</p> <p>(not significant)</p>	Operation

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Tributary to River Tame at Jack O'Watton Industrial Estate, Water Orton.  (SWC-CFA19-012) Map WR-01-032 (D5)	Moderate	Watton Lane embankment including surface drainage  Water Orton no.3 viaduct  Water Orton no.4 viaduct  Water Orton no. 2 viaduct  River Tame west viaduct  River Tame east viaduct  Diverted watercourse  Drainage outfall  Balancing pond  Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting materials.	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (from railway)	Moderate adverse	<p>Impact on flows in the receiving watercourse.</p> <p>Deterioration of water quality due to contamination of surface water from both routine discharges from the proposed railway and associated infrastructure or from accidental spillages.</p>	<p>Drainage has been designed to reduce the rate and volume of run-off from the proposed railway and to provide temporary storage for potential spillages.</p> <p>Balancing pond before outfall to watercourse to restrict run-off rates and reduce the effect on water quality by reducing potential contaminants through filtration, vegetative absorption or settlement.</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>Construction (Permanent)</p>
		Scour protection works local to outfall along watercourse and re-profiling and vegetation/debris clearance in watercourse	Moderate adverse	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourse.	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>Construction (Permanent)</p>

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Diversion of watercourse	Moderate adverse	Deterioration or loss of the existing water environment, flows and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourses, for example by including meanders and enhanced banks.	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	None required	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	Construction (Permanent)
		All elements (maintenance)	Moderate adverse	Deterioration of water quality due to contamination from de-icing substances used during cold weather and herbicides for managing vegetation on the tracks.	Best practice pollution control guidance will be adopted for maintenance of the Proposed Scheme.	Negligible Neutral (not significant)	None required	Negligible Neutral (not significant)	Operation

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
River Tame at Coleshill Industrial Estate, Edison Road. (SWC-CFA19-013) Map WR-01-032 (C5)	Very high	Watton Lane embankment including surface drainage  Water Orton no.4 viaduct  River Tame west viaduct  River Tame east viaduct  Scour protection works local to outfall.	Moderate adverse	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting	Adoption of Environment Agency PPGs – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Temporary)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Scour protection works local to outfall.	Moderate adverse	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to retain and if possible enhance the overall quality of the watercourse.	Negligible Neutral (not significant)	None required	Negligible Neutral (not significant)	Construction (Permanent)
Tributary of River Tame – extended culvert under M42/B4117 Gilson Road, Water Orton, north chord (from Curzon Street Station to Manchester).  (SWC-CFA19-015) Map WR-01-032 (D6); Tributary of River Tame south of Gypsy Lane, Water Orton, north chord (from Curzon Street Station to Manchester).  (SWC-CFA19-016) Map WR-01-032 (D6);	Moderate	Marsh Lane embankment including surface drainage.  Water Orton viaduct no.1  Water Orton viaduct no.4  Water Orton culvert and culverts for drainage.  Assumed realignment of watercourse to suit embankment profile.  Drainage outfall  Balancing pond  Realigned Attleboro Lane and B4118 Birmingham Road (overbridge).  Scour protection works local to outfall.	Moderate adverse.	Deterioration of water quality due to:  Deposition of soils, sediment and other construction materials, and spillage of fuels and other hazardous liquids;  The mobilisation of contaminants following disturbance of contaminated ground or groundwater;  Uncontrolled site run-off.  In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology	Adoption of Environment Agency Pollution Prevention Guidelines (PPG) – particularly PPG5 for in-channel works.  Mitigation measures outlined in draft CoCP.  Water management implemented during earthworks operation.  Temporary site drainage designed to retain surface run-off within site boundary.  Grey water systems used at construction compounds.	Negligible Neutral (not significant)	None required	Negligible Neutral (not significant)	Construction (Temporary)

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Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Tributary of River Tame south of Vicarage Lane, Water Orton, north chord (from Curzon Street Station to Manchester)  (SWC-CFA19-019) Map WR-01-032 (D6).				<p>supported, through the disturbance of silt or the direct contamination by polluting materials.</p> <p>In-channel construction work has the potential to have a moderate impact on the existing water environment, flows and the ecology supported, through the disturbance of silt or the direct contamination by polluting.</p>					

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (from railway).	Moderate adverse.	<p>Impact on flows in the receiving watercourse.</p> <p>Deterioration of water quality due to contamination of surface water from both routine discharges from the proposed railway and associated infrastructure or from accidental spillages.</p>	<p>Drainage has been designed to reduce the rate and volume of run-off from the proposed railway and to provide temporary storage for potential spillages.</p> <p>Balancing pond before outfall to watercourse to restrict run-off rates and reduce the effect on water quality by reducing potential contaminants through filtration, vegetative absorption or settlement.</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	Construction (Permanent)
		Scour protection works local to outfall.	Moderate adverse.	Works may impact on the existing water environment, potentially changing flow characteristics and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourse.	<p>Negligible</p> <p>Neutral (not significant)</p>	<p>None required</p>	<p>Negligible</p> <p>Neutral (not significant)</p>	Construction (Permanent)

Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
		Drainage outfall (associated with the B4118 Birmingham Road overbridge and diversion of Attleboro Lane, assumed to have mitigation and outfall to tributary of River Tame south of Vicarage Lane).	Moderate adverse.	Impact on flows in the receiving watercourse.  Deterioration of water quality due to contamination of surface water from both routine discharges from the road and associated infrastructure or from accidental spillages.	Drainage has been designed to reduce the rate and volume of run-off from the road and to provide temporary storage for potential spillages.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Construction (Permanent)
		Realignment of watercourse to suit embankment profile.	Moderate adverse.  Negligible to Minor Beneficial.	Deterioration or loss of the existing water environment, flows and the ecology supported.	Opportunities will be taken to maintain and if possible enhance the overall quality of the watercourses, for example by including meanders and enhanced banks.	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	None required	Minor to Minor Beneficial  Slight to Slight Beneficial (not significant)	Construction (Permanent)
		All elements (maintenance).	Moderate adverse.	Deterioration of water quality due to contamination from de-icing substances used during cold weather and herbicides for managing vegetation on the tracks.	Best practice pollution control guidance will be adopted for maintenance of the Proposed Scheme.	Negligible  Neutral (not significant)	None required	Negligible  Neutral (not significant)	Operation



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Surface water feature/ receptor <sup>10</sup>	Value of surface water feature <sup>11</sup>	Design element	Magnitude of impact (no mitigation)	Potential impact to water resource	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Pond south of Vicarage Lane, Gilson, north chord (from Curzon Street Station to Manchester).  (SWC-CFA19-020)	Refer to ecology Volume 2, CFA Report 19, Section 7. for impacts assessment.								

**Map WR-01-032  
(D6)**

## 4.2 Groundwater

4.2.1 Following the methodology outlined in the SMR addendum (see Volume 5: Appendix CT-001-000/2), the hydraulic conductivity values; obtained from available literature values, were used in conjunction with professional judgment to estimate the maximum extent of the zone of influence that is likely to be produced when dewatering of a cutting occurs. The hydraulic conductivity values used are generally in the high range of literature values to provide a realistic factor of safety to the estimated zone of influence. Based on this worst case assumption, the zone of influence is likely to be overestimated, however for the purpose of this preliminary assessment, this approach is considered to be acceptable.

4.2.2 Aquifer properties used for estimating the zone of influence can be found in Table 7.

Table 7: Aquifer properties

Lithology	Maximum hydraulic conductivity value used in calculations	References
Mercia Mudstone Group-Mudstone and Dolomitic siltstone.	0.1m/d	Hiscock 2005 <sup>12</sup>
Alluvium	864m/d	Hiscock 2005
River Terrace Deposits	51.8m/d	An average of sand values from Domenico and Schwartz 1990 <sup>13</sup>
Glaciofluvial Deposits Sand and Gravel	86.4m/d	Hiscock 2005
Glaciolacustrine Deposits – clay and silt	0.0000864m/d	Hiscock 2005
Head Deposits	0.173m/d	Domenico and Schwartz 1990

4.2.3 The zone of influence for the dewatering of the cuttings along the route was calculated at frequent intervals as topography, geology and track level changed, using the methodology outlined in the Technical Note in the SMR addendum see Volume 5: Appendix CT-001-000/2 and the properties in Table 7. Table 8 summarises the estimated zone of influence within the study area for each of the cuttings. In each case, the maximum zone of influence value reported has not been applied to the whole extent of the cutting; it is purely illustrative of the worst-case conditions at its deepest section.

<sup>12</sup> Hiscock, K.M. (2005), Hydrogeology: Principles and Practice, Blackwell Science Ltd, Oxford.

<sup>13</sup> Domenico, P.A. and F.W. Schwartz, 1990. Physical and Chemical Hydrogeology, John Wiley & Sons, New York.

Table 8: Estimated zone of influence for cuttings within Coleshill Junction study area

Cutting	Geology	Maximum drawdown within cutting	Maximum zone of influence estimated from maximum drawdown	Comments
Gilson cutting	Glaciolacustrine Deposits, Mid Pleistocene – Clay and Silt.	10m	1m	
	Glaciofluvial Deposits, Mid Pleistocene – Sand and Gravel	10m	750m	Spatially limited to the extent of the superficial deposit.
Water Orton cutting	Mercia Mudstone – Mudstone	5m	16m	
	Head (clay, silt, sand and gravel)	2m	8m	
	Head (clay, silt, sand and gravel)	2m	8m	
	Mercia Mudstone – Mudstone	13m	42m	
	Glaciofluvial Deposits, Mid Pleistocene – Sand and Gravel	3m	2850m	

4.2.4 Table 9 summarises the potential impacts to groundwater, abstractions, water dependent habitats and groundwater/surface water interactions.

Table 9: Summary of potential impacts to groundwater, abstractions, water dependent habitats and groundwater/surface water interactions

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
<b>Aquifers</b>								
Secondary B aquifer in Mercia Mudstone (moderate)	Gilson cutting  Water Orton cutting  Gilson road autotransformer station (ATS)  Foundations for viaducts and bridges  Construction compounds  Embankments	Moderate adverse	Dewatering may reduce the groundwater levels within the aquifer.  Potential for contaminants to enter groundwater during construction (e.g. suspended solids, leaks from machinery).  Foundations have potential to alter groundwater flow regime, however any change is likely to be localised and minimal.	Sustainable drainage systems (SuDS) such as infiltration trenches will be located where gravity transfer is feasible to facilitate groundwater recharge.  Retaining walls to constrain zone of influence.  Contamination control measures as required by the draft CoCP Section 16.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	Construction (Temporary)

<sup>14</sup> Map references taken from Volume 5: Map Book – water resources, Map WR-02-019 and Volume 5: Map Book – ecology, Maps EC-01 to EC-04.<sup>15</sup> For examples of receptor value see Table 43 in the SMR addendum Volume 5 Appendix CT-001-000/2.

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Secondary A aquifer in Glaciofluvial (moderate)	Gilson cutting Foundations for viaducts and bridges Construction compounds Embankments	Moderate adverse	Dewatering may reduce the groundwater levels within the aquifer.  Potential for contaminants to enter groundwater during construction (e.g. suspended solids, leaks from machinery).  Foundations have potential to alter groundwater flow regime, however any change is likely to be localised and minimal.	SuDS such as infiltration trenches will be located where gravity transfer is feasible to facilitate groundwater recharge.  Retaining walls to constrain zone of influence.  Contamination control measures as required by the draft CoCP Section 16.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	Construction (Temporary)
Secondary A aquifer in Alluvium (moderate)	Foundations for viaducts and bridges Construction compounds Embankments	Minor adverse	Potential for contaminants to enter groundwater during construction (e.g. suspended solids, leaks from machinery).  Foundations have potential to alter groundwater flow regime, however any change is likely to be localised and minimal.	None required.	Minor  Slight (not significant)	None	Minor  Slight (not significant)	Construction (Temporary)
Secondary A aquifer in River Terrace Deposits (moderate)	Foundations for viaducts and bridges Construction compounds Embankments	Minor adverse	Potential for contaminants to enter groundwater during construction (e.g. suspended solids, leaks from machinery).  Foundations have potential to alter groundwater flow regime, however any change is likely to be localised and minimal.	None Required.	Minor  Slight (not significant)	None	Minor  Slight (not significant)	Construction (Temporary)

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
<b>Water dependent habitats</b>								
River Cole (high)  Map EC-01-054b, (B6), located along the River Cole between Chelmsley Wood and Gilson	Coleshill viaduct no. 1  Coleshill viaduct no. 2  Coleshill embankment no. 3  Birmingham Road underbridge	Minor adverse	Possible quality impact associated with emplacement of viaduct foundations and surface water run-off.	SuDS in the form of filter strips and infiltration trenches will be located where gravity transfer is feasible to facilitate groundwater recharge.  Contamination control measures as required by the draft CoCP Section 16.	Negligible  Neutral (not significant)	None	Negligible  (not significant)	None
Wheeley Moor Farm Meadows (moderate)  Map EC-01-054b, (B7), located approximately 1.1km north east of M42/M6 toll junction near Chelmsley Wood (junction 7a)	Coleshill viaduct no. 1	Moderate adverse	Reduce infiltration and quality of run-off due to road in the north. Earthworks or piling activities may impact quality.  Operation: Spillages and road run-off could impact quality in vicinity of road.	SuDS in the form of filter strips and infiltration trenches will be located where gravity transfer is feasible to facilitate groundwater recharge.  Contamination control measures as required by the draft CoCP Section 16.	Negligible  Neutral (not significant)	None	Negligible  (not significant)	Construction (Permanent) and Operation

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Coleshill Hall Farm (moderate)  Map EC-01-054b, (5B), located approximately 1.1km north east of M42/M6 toll junction near Chelmsley Wood (junction 7a)	Coleshill viaduct no. 1	Moderate adverse	Reduced infiltration and quality of run-off associated with route. Earthworks or piling activities may impact groundwater quality.	SuDS in the form of filter strips and infiltration trenches will be located where gravity transfer is feasible to facilitate groundwater recharge.  Contamination control measures as required by the draft CoCP Section 16.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	Construction (Permanent)
Coleshill Park Belt (moderate)  Map EC-01-055, (E8), located approximately 500m south west of the M42/M6 junction at Gilson (junction 8)	Gilson embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None
Coleshill Sewage works Grassland (moderate)  Map EC-01-055, (A6), located approximately 1.3km north of the M42/M6 junction at Gilson (Junction 8)	Watton House embankment	Minor adverse	Emplacement of water main may impact quality of groundwater. Excavation of balancing pond may temporarily reduce groundwater levels.	None required.	Minor  Slight (not significant)	None	Minor  Slight (not significant)	Construction (Temporary)
Marsh Lane Grassland and Marsh (moderate)  Map EC-01-066a, (E1), located approximately 500m west of Water Orton Station	Watton House embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Water Orton Triangle (moderate)  Map EC-01-066a, (F1), located approximately 900m west of Water Orton Station	River Tame viaduct	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None
<b>Groundwater / Surface Water Interactions</b>								
Issues (moderate), 1,200m east of the route  Map WR-02-019 (F5), located 1.3km south-east of M6 Motorway North viaduct	Pool Wood embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None
Issues (moderate), 1,300m east of the route  Map WR-02-019 (F5), located 1.4km south-east of M6 Motorway North viaduct	Pool Wood embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None
Issues (moderate), 88m west of the route  Map WR-02-019 (F7), located 110m north of M6 Motorway North viaduct	Motorway viaduct no. 3	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Minor tributary of River Cole (moderate), will be crossed by the route  Map WR-02-019 (F6), will be crossed by Coleshill West viaduct	Coleshill viaduct no. 1	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.  Stream will flow beneath viaduct.	Not required.	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None
Issues (moderate), will be crossed by the route  Map WR-02-019 (E6), will be crossed by Coleshill West viaduct	Coleshill viaduct no. 1	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.  Issues are to be culverted beneath route.	Not required.	Minor  Slight  (not significant)	None	Minor  Slight  (not significant)	None
Coleshill Hall Brook (moderate), will be crossed by the route  Map WR-02-019 (E6) will be crossed by Coleshill West viaduct	Coleshill viaduct no. 1	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None
Pond (low), 60m east of the route  Map EC-04-054b (B5), located 200m east of Coleshill West viaduct	Coleshill embankment no. 3	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Pond (low), 80m east of the route  Map EC-04-55 (H5), located 180m north-east of Coleshill West viaduct	Coleshill embankment no. 3	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 20, Section 7.				
River Cole (high), will be crossed by the route  Map WR-02-019 (E6), will be crossed by M42 Coleshill West Viaduct	Coleshill embankment no. 4	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible Neutral (not significant)	None	Negligible Neutral (not significant)	None
Sinks (moderate), 220m east of the route  Map WR-02-019 (E6), located 230m east of M42 Coleshill North viaduct	Coleshill viaduct no. 5	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible Neutral (not significant)	None	Negligible Neutral (not significant)	None
Pond (low), 10m east of the route  Map EC-04-55 (E5), located 10m east of M42 Coleshill North viaduct	Coleshill North viaduct	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				
Collects (moderate), 50m east of the route  Map WR-02-019 (E6), located 100m north-east of M42 Coleshill North viaduct	Gilson embankment	Negligible	May reduce infiltration, potential for contamination to enter the groundwater during construction.	Not required.	Minor Slight (not significant)	None	Minor Slight (not significant)	None

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Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Minor tributary of River Tame (moderate), will be crossed by the route  Map WR-02-019 (D6), will be crossed by Water Orton viaducts 1 and 3	Watton House embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None
Minor tributary of River Tame (moderate), will be crossed by the route  Map WR-02-019 (D6), located 60m west of Water Orton viaducts 1 and 3	Watton House embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None
Pond (moderate), 215m west of the route  Map EC-04-55 (C6), located 265m south of Water Orton viaducts 1 and 3	Gilson cutting	Moderate adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				
River Tame (very high), will be crossed by the route  Map WR-02-019 (D6). Will be crossed by River Tame West viaduct.	Curdworth viaduct (South) satellite compound  River Tame West viaduct  River Tame utility overbridge  Water Orton no. 1 viaduct	Minor adverse	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater  Reduced infiltration could locally reduce groundwater levels, however this is likely to be minimal and temporary.  Reduced infiltration could locally reduce groundwater levels; however, this is likely to be minimal and temporary.	SuDS in the form of infiltration trenches will be located at the southern end of Burton Green tunnel to facilitate groundwater recharge.  Contamination control measures as required by the draft CoCP Section 16.	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	Construction (Permanent)

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Minor tributary of River Cole (extended culvert) (moderate), will be crossed by the route (Birmingham spur)  Map WR-02-019 (D7), located 350m south-east of M42-M6 Motorway Link West viaduct	Green Lane embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None
Spring (moderate), 650m south-west of the route (Birmingham spur)  Map WR-02-019 (E7), located 780m west of M42 Coleshill South viaduct	Coleshill viaduct no. 5	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None
Issues (moderate), 710m south-west of the route (Birmingham spur)  Map WR-02-019 (E7), located 680m south of M42-M6 Motorway Link West viaduct	Gilson embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral  (not significant)	None	Negligible  Neutral  (not significant)	None

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Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Pond (low), will be crossed by the route (Birmingham spur)  Map EC-04-066a (G7), located 305m south-east of M42-M6 Motorway Link West viaduct  Identifier 030-AA-195001	Gilson embankment	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				
Pond (low), will be crossed by the route (Birmingham Spur)  Map EC-04-066a (E5), located 355m north-west of M42-M6 Motorway Link West viaduct	Lichfield Road embankment	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				
Issues (moderate), 325m west of the route (North Chord)  Map WR-02-019 (D6), located 360m south-west of River Tame West viaduct	Watton House embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible Neutral (not significant)		Negligible Neutral (not significant)	None

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Minor tributary of River Tame (moderate), will be crossed by the route (North Chord)  Map WR-02-019 (D6), will be crossed by Water Orton viaducts 1 and 3	Water Orton viaduct no. 4	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None
Minor tributary of River Tame (moderate), will be crossed by the route (North Chord)  Map WR-02-019 (D7), located 235m south-west of Water Orton viaducts 1 and 3	Marsh Lane embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible  Neutral (not significant)	None	Negligible  Neutral (not significant)	None
Pond (low), will be crossed by the route (North Chord)  Map EC-04-066a (F4) located 455m south-west of Water Orton viaducts 1 and 3  Identifier 030-AA-210001	Marsh Lane embankment	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 20, Section 7.				

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Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Pond (low), 130m north of the route (North Chord)  Map EC-04-066a (F4) located 490m south-west of Water Orton viaducts 1 and 3  Identifier o30-AA-210004	Marsh Lane embankment	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				
Minor tributary of River Tame (moderate), will be crossed by the route (North Chord)  Map WR-02-019 (D7), located 530m south-west of Water Orton viaducts 1 and 3	Marsh Lane embankment	Negligible	Not located within zone of influence therefore unlikely to receive adverse impacts from changes to groundwater.	Not required.	Negligible Neutral (not significant)	None	Negligible Neutral (not significant)	None
Pond (low), 91m north of the route (North Chord)  Map EC-04-066a (E5), located 660m south-west of Water Orton viaducts 1 and 3  Identifier o30-AA-210003	Marsh Lane embankment	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				

Groundwater receptor <sup>14</sup> (and value <sup>15</sup> )	Design element	Magnitude of impact (no mitigation)	Potential impact to groundwater	Avoidance and mitigation measures	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Pond (low), 20m south of the route (North Chord)  Map EC-04-066a (E5), located 350m north-west of M42-M6 Motorway Link West viaduct	Marsh Lane embankment	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				
Pond (low), 80m north of the route (North Chord)  Map EC-04-066a (E5), located 520m north-west of M42-M6 Motorway Link West viaduct	Marsh Lane embankment  Water Orton cutting	Major adverse	Pond assumed to be removed during construction of the Proposed Scheme.	Refer to ecology Volume 2, CFA Report 19, Section 7.				

## 5 References

Domenico, P.A. and F.W. Schwartz (1990), *Physical and Chemical Hydrogeology*, John Wiley & Sons, New York.

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